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Methylation alterations of LINE-1 and imprinting genes related to folate deficiency during embryo development

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Periconceptional maternal folate deficiency is a risk factor for neural tube defects (NTDs), the mechanism under lied remains unclear. Intracellular folic acid is thought to be key player in providing an adequate source of methyl groups for methylation of DNA and proteins, and methylation modifications of repeat elements and imprinting genes is suggested to be sensitive to epigenetic regulation of folate acid nutrition in developmental programming. However, the mechanism of how folate deficiency alters methylations modification of repeat elements and imprinting genes in earlier development is still unclear. Our present study analyzed methylation modification alternations of LINE-1 and imprinting genes using NTD cases, mESCs with folate deficiency, and also in mouse models with periconceptional folate-deficiency. The results implying that hypomethylation of LINE-1 was associated with an increased risk of NTDs. Folate insufficiency induced LINE-1 hypomethylation at the lowest levels in folate-free ESCs, compared with that in the folate-normal group. Moreover, LINE-1 methylation level was positively correlated with folate content, and negatively correlated with homocysteine content. Similar kinds of imprinting genes also altered imprinting modifications in NTDs with folate deficiency, including Gnas imprinting cluster, DLK-MEG3 imprinting cluster, MEST imprinting and H19/IGF2 imprinting. Mouse embryos exhibited a significantly increased ratio of IUGR and developmental dysplasia of the brain in response to folate deficiency. Data shown here implies that periconceptional maternal folate deficiency altered the imprinting established and gene expression in fetal brains, which may be associated with the higher ratio of developmental dysplasia.

Biography

Li Wang has completed her PhD at the China Agriculture of University in 2007, and became a Junior Faculty Member at Beijing Municipal Key Laboratory of Child Development and Nutriomics, Capital Institute of Pediatrics, and since 2014, she became the Director of Medical Genetic Department of CIP. The primary interest of her lab is in the interaction of genetics and environment, in particular early nutrition and developmental programming. She has published over 10 articles in a variety of epigenetic alternations that range from diseases to cell and animal models with experiences.

The author of 29 books (1 in English "Cytogenetics of Mammalian Embryonic Development" Oxford University Press 1987,356pp) and over 400 scientific papers.

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